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ABSTRACT

Project activities were conducted to accomplish three major objectives: (1) to develop a definition of minimum mathematical skills necessary to complete vocational skill training in fifteen areas, (2) to develop learning activity packets relevant to each vocational area, and (3) to make the process and packets available to other vocational schools. A project coordinator carried out the project activities; vocational and math teachers develcped 230 learning packets. The packets utilize the individualized approach to teaching math skills through related vocations. Two hundred ten tenth-grade students from three school districts participated in the project. Each student received a diagnostic test in mathematical competency at the start of the school year, and based on this score, received appropriate learning activity packets. Pre-post test measurement with the Total Mathematics battery of the Comprehensive Tests of Basic Skills disclosed that students showed an increase, though not statistically significant, in scale scores and in grade equivalency after having utilized the learning activity packets. (A copy of the vocational trade math comprehension test is appended.) (CSS)

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FINAL REPORT

PROJECT NO. 77-009

LEARNING ACTIVITY PACKETS FOR MINIMAL MATHEMATICS COMPETENCIES IN VOCATIONAL EDUCATION

Exemplary Project in Vocational Education
Conducted Under
Public Law 90-576
Section 132 of P.L. 94-482

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Earl Fisher, Project Coordinator
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Post Office Box 28
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June 30, 1978

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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EXEMPLARY PROJECT IN VOCATIONAL EDUCATION

CONDUCTED UNDER SECTION (132) of

PUBLIC LAW 94-482

The Project reported herein was performed pursuant to a grant from the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgement in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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TABLE OF CONTENTS

Item		Page
1.	Cover Page	1
2.	Title Page	2
3.	Table of Contents	3
4.	Summary of Report	
	A. Time Period	4
	B. Goals and objectives	4
	C. Procedures	5
	D. Results and Accomplishments	5
	E. Evaluation Summary	6
	F. Conclusions and Recommendations	6
5.	Body of the Report	
	A. Problems - Setting - Literature Review	7
	B. Goals and Objectives	9
	C. Project Description and Plan	10
	D. Results	14
	E. Evaluation	14
	F. Conclusions	25
6.	Appendices	

Teacher Survey Form	Appendix A
Student Survey Form	Appendix B
Management Document Activity Report	Appendix C
Student Profile Form	Appendix D
Comprehension Test	Appendix E
LAP Functions and Exemptions Form	Appendix F

4. A) Summary

Project activities have been conducted during a 14 month period beginning 1 May, 1977 and ending 30 June, 1978. Two phases of developmental activities have been conducted. During Phase I teachers at Dorchester Vocational Center and mathematics teachers from three Dorchester County High Schools worked together to identify seventeen math skills needed to perform in vocational areas. Two hundred thirty Learning Activity Packets were written and prepared for field testing during Phase II. A minimum skills proficiency test used in another district was adapted for use in this project. During Phase II all 10th grade students at the Vocational Center were tested using the minimum skills test in order to determine mathematics LAPS needed.

Student profile sheets were developed and records kept of math LAP completion (LAP - Learning Activities Packet).

4. B) Major Objectives

1. To develop a definition of the minimum mathematical skills necessary to complete vocational skill training in 15 areas.
2. To develop Learning Activity Packets relevant to each vocational area using practical activities and terminology of the specific skill area and avoiding any sex bias.
3. To make the process and packets available to other vocational schools that might experience similar mathematical skill deficiencies.

These specific objectives have been accomplished and are camera ready copies of each learning activities packets and a copy of the minimum skills proficiency test is attached.

4. C) Procedures

A project coordinator was employed who served to carry out the project activities. Seventeen vocational teachers and four math teachers worked during May and June to develop two hundred thirty learning packets to be utilized in an individualized approach to teaching math skills through related vocations. A minimum proficiency exam was adapted for use as a diagnostic instrument to determine specific skills needs of students.

During the period September to May students attended sessions and worked on Learning Activity Packets encompassing skills needed as indicated by the minimum skills proficiency test. An aide and secretary and the project coordinator served to assist students in accomplishing their individual Learning Activity Packet tasks and administering tests to insure mastery of skills.

4. D) Results

A total of 333 students received the minimum skills proficiency test. Nine students did not complete. Forty students were found to require no remediations. Two hundred ten students completed the mathematics Learning Activity Packet activities.

Mathematics Learning Activity Packets have been developed and are now available for reproduction and distribution to interested vocational centers in South Carolina. Although evaluation results do not support a statistically significant gain in scale scores on standardized tests, these packets represent the first such effort in South Carolina to relate math skills to vocational training areas. The modest gain in scale scores

among participating students for such a short line period is evidence that great value will be achieved by having packets available for utilization by vocational instructors when encountering students who exhibit mathematics deficiencies which hamper their progress in vocational education.

4. E) Evaluation Summary

Two hundred and ten 10th grade students from Dorchester County School Districts One, Two and Three, participated in the project. Each student received a diagnostic test in mathematical competency at the start of school year 1977-78, and, based on his score, received appropriated Learning Activity Packets. Pre-post test measurement with the Total Mathematics battery of the Comprehensive Tests of Basic Skills disclosed that students from each district, on the average, showed an increase in scale scores and in grade equivalency after having received the LAPs, although the increases were not high enough to be statistically significant. Nevertheless, the program has demonstrated educational significance in that (1) a remediational program in mathematics, as realted to vocational curriculums, has been developed, (2) effective procedures for implementing such a program have been developed and tested, (3) students have shown increases in scale scores and grade equivalency after having received the program, and (4) both students and teachers involved in the program have rated it positively.

4. F) Conclusions and Recommendations

Every effort should be made to further field test LAPs in vocational schools in South Carolina. The development and field test activities have been conducted during a 14 month period and ample opportunities for development and refinement of procedures have not been available.

The positive gain in scale score experienced by the subjects is an indication that growth was accomplished even in a developmental period of project activities. The LAPs, in the opinion of the project staff, hold great promise for major assistance to vocational teachers in South Carolina to orient and train students in math skills necessary to function in their chosen vocational skill area.

5. A) Setting - Problem - Literature Review

Dorchester County Vocational Center serves students from three high schools in Dorchester County. Students are transported by bus from Harleyville-Ridgeville High School, Summerville High School and St. George High School. The school offers 15 areas of skill training. The school operates directly under the leadership of the center director and receives financial support through a county-wide tax millage levy for operational costs. As other such schools in South Carolina, the school also received financial support for the programs through the South Carolina Department of Education Office of Vocational Education.

The arrangement of serving students from three separate high schools makes curriculum coordination between the schools particularly difficult. Vocational teachers seldom have the opportunity to intereact with acedemic teachers. The curriculum offerings at the three high schools are primarily oriented toward college preparatory activities. Students choosing vocational skill training are often unable to make the transfer of knowledge and skill training to the vocational area. This is particularly true in mathematics. Vocational teachers feel that certain minimum mathematical skills must be learned and mastered in order to function in learning these vocational skills. Many of these mathematical skills are common to all areas. Some mathematical skills are more necessary in some vocational areas than in others.

The results of surveys in DVC in January 1977 indicated that 69.6% of students taking a basic mathematics test failed to score an acceptable passing mark. First and second year vocational student's mathematics scores on the California Test of Basic Skills in Spring 1976 from two high schools being served were unacceptable. Data from the other school is not available; but in the opinion of instructors who work with these students each day, similar deficits are apparent. Employment security counselors in the area indicated that 62% of students taking preemployment math tests were not able to pass this test.*

The staff felt that using a minimum skills mathematics test, students' mathematical weaknesses could be analyzed and dealt with specifically. Using a learning activity packet compiled by the vocational instructor of the skill area in which the student is enrolled, a very practical "hands on" activity could be used that would be relevant for the student; and he would be able to draw a parallel between the math skill and its practical vocational use.

A review of the literature available was accomplished through a scan of the ERIC files through the services of the South Carolina Department of Education E. P. Center computer search. The E. P. Center staff was able to provide service in a minimum of time. The topics researched were 1) Vocational Mathematics; 2) Learning Activity Packets; and 3) Minimum Competency Programs.

The activities of the proposed program followed a test-instruct-retest format using a minimum skills test and learning activity packets for instructional activities. The search for the minimum competency topic and related activities revealed that minimum competency techniques are rapidly being utilized in most areas of both public and technical education. However, no

*(See Appendix E

specifically math-vocational minimum competency materials became visible through the search.

ERIC summaries of mathematics materials revealed a series of math materials edited by Norma Cousler in a project in Oregon entitled Oregon Vo-Tech Project. Due to time constraints only ERIC summary sheets were available, but the ERIC hard copy reports have now been ordered and seem to have promise for offering assistance to project personnel in establishing a mode and format for the development of Learning Activity Packets. These materials were produced in 1974.

Nicholas K. Herr, in a booklet entitled Math Practice Exercises, provided everyday living mathematics examples that include vocational terminology which will be valuable also to project personnel. Magram, through a correlated curriculum project, offers career related mathematics terminology and skills. Burris and George experimented with an audio-tutorial approach to vocational math skills in the Burlington Community College: New Jersey.

Learning Activity Packets have been used successfully in the Ninety Six High School, Ninety Six, S. C. Although the emphasis was in academic math skills, the packets have proven successful and have been disseminated state wide. This highly successful Title III, P.L. 89-10 project is the model that will be followed in the development of pertinent vocational mathematics Learning Activity Packets.

5. B) Goals

The major goals of the project were:

(1) to develop a definition of the minimum mathematical skills necessary to complete vocational skill training in 15 areas;

(2) to develop learning activity packets relevant to each vocational area, using practical activities and terminology of the specific skill area; and,

(3) to make the process and packets available to other vocational schools that might experience similar problems of mathematical skill deficits.

The specific student objective was:

By May 1978, those 10th grade students who were identified at the start of school year 1977-78 as deficient in the minimum mathematical competencies necessary to complete the vocational educational curriculum and who received the Learning Activity Packets (LAPS) during the school year 1977-78 will achieve mean scale scores significantly (0.05 level) higher than would be expected for untreated normative sample students.

5. C) Plan

Mr. Roger Templin, Director of the Vocational School, was instrumental in coordinating vocational teacher efforts to bring the mathematical deficit problem into focus. He held conferences with each vocational teacher, analyzed standardized test data, administered basic math skills tests to students enrolled in the center, held conferences with heads of mathematics departments in each high school, and met with Superintendents to try to alleviate the problem. After conferring with all of the above, the proposal was developed to try to meet the need. After development of the concept, the project proposal was discussed with Mr. Bill Hynds, Mathematics Consultant of the State Department of Education. Mr. Hynds assisted in the technical aspect of the project operation after the project was funded. Mr. Templin served as project director at no cost to the project.

Phase I

Beginning 1 May 1977, Mr. Earl Fisher was employed to coordinate project activities for the project's funding period.

His experiences include seven years with Trident Technical College instructing management and supervisory development training curriculum, blue print reading, drafting, speed reading and several other courses. His background as sales manager and light test coordinator in private industry further qualified him to assume the responsibility as project coordinator.

During the month of May the project employed four mathematics consultants for three days each to research available vocational mathematics materials and to collect and gather materials which were appropriate to the 15 vocational courses offered at Dorchester Vocational Center. The courses the packets were written for are: Auto Body Repair, Auto Mechanics, Carpentry, Child Care, Distributive Education, Drafting, Electricity, Forestry, Graphics, Heating/Air Conditioning, Industrial Sewing, Masonry, Office Occupations, Small Engines and Welding. Refer to Appendix F describing the seventeen various LAP functions for each vocational course with the appropriate exemptions.

During June the above consultants were employed to meet for two days with vocational teachers and four math teachers from the high schools represented to help to define minimum math skills necessary for each area and to devise test items to be included in the minimum skills test. Vocational teachers were employed for the entire month of June. Because they are required to provide ½ month salary for each of them. Four math teachers were employed for 20 days during June to assist in the developmental phase of the project.

The primary task of the vocational and mathematics teachers after defining minimum skills was to write activities using terminology of the vocational area and to plan for maximum utilization of the materials that were previously identified by the consultants. By the end of Phase I on June 30, 1977, one copy of each LAP was developed and turned over to the project director and coordinator to duplicate during July and August in Phase II. The vocational center was able to secure the services of Dr. Herb Tyler, Associate Superintendent of Richland District Two Schools, to serve as continuing consultant in curriculum development and in a project administration advisory capacity. Dr. Tyler has wide experience in curriculum development and project management and assisted in the operation of the project.

Phase II

During July and August the project coordinator and project director purchased the necessary materials, had activities typed and duplicated and compiled them into appropriate LAPs. Two paraprofessionals were employed. A secretary-typist, aide, bookkeeper was employed to help with project financial records, project correspondence, reproduction of mathematics materials, and cataloging and setting up a management system for the LAPs in the area where they were stored. A second paraprofessional was employed to be be available to assist students and vocational teachers in locating relevant materials for LAP support. The paraprofessional position will be continued with local and/or other funds for the 1978-79 school year.

LAPs and the process for using a minimum skills test were field tested during the 1977-78 school year, utilizing first year vocational students. When first year students attend the first session at Dorchester County Vocational Center in September 1977, they are given the minimum skills proficiency test adopted during Phase I. Those students not making a

satisfactory score on various sections of minimum competency test became project students.

Working with the project coordinator, vocational teachers and the materials paraprofessional, an individual schedule of LAPs was devised for each student according to his or her own profile. Once the student had completed a LAP for a given section of minimum skills test, he or she could take the LAP test to attempt to qualify. Each student continued to work on LAPs, but also interacted with the vocational teacher and began receiving vocational training.

A special area is available in the Dorchester Vocational School that was established as a math materials center. Students work in the materials center or in the individual shop or vocational training area, depending on his specific need. When all first year students were being adequately served, the vocational teachers were given the opportunity to refer second and third year students for testing and LAP activity. As students completed required LAP activities, they resumed full time vocational instruction.

Project Evaluator was Dr. James E. Wise. His qualifications are listed below:

EDUCATION

1. B. S. (Experimental Psychology): 1966, Old Dominion University (Honors).

2. M. S. (Educational Psychology/Guidance and Counseling - split major): 1968, Old Dominion University

3. Ph. D. (Psychological Foundations of Education): 1973, University of South Carolina

EXPERIENCE

1. Psychological and Educational Research:

   1962 - 1966: Research Engineer, Human Sciences Research Inc. McLean, Virginia.

   1973 - 1974: Educational Researcher, Perception Research Section, University of South Carolina.

CONSULTATION

1. 1971 - 1976: Psychometric consultation for Williamsburg County School System, Kingstree. South Carolina.

2. 1973 - 1976: Evaluative consultation for Richland County 2, School District, Columbia, South Carolina.

3. 1974 - 1976: Psychometric consultation for S. C. Commission for the Blind, Columbia, South Carolina.

In addition to the above education and experience Dr. James E. Wise also has to his credit over 20 professional papers and technical reports that have been published in the areas of human factor analysis and evaluation.

5. D - E) Results and Evaluation

(1) Process Evaluation

Two process (formative) objectives were listed in the Project Evaluation Plan. They were as follows:

- Objective One - To provide quarterly analysis of all activities listed in the proposal through the Management Document Activity Reports/Log (a specially prepared form/log that is to be completed by project personnel for each project activity listed in the Management Document section of the project proposal). These analyses will insure that each project activity is completed within the proper time frame and in accordance with anticipated outcomes.

- Objective Two - To develop and prepare the Final Project Evaluation Report.

The following discusses the procedures and/or techniques used to implement the process objectives.

Objective One - The report/log format mentioned in first objective was developed by the Evaluator Procedures for using or encoding it were presented to project personnel during the first part of Phase I (May 1 - June 30, 1977). A copy is contained in the appendix to this section. The reports (MDAR) were to be retained until the end of each quarter and then mailed to the Evaluator. Then, the Evaluator was to perform a discrepancy analysis on the MDAR's. This system was the vehicle by which the Evaluator was to provide formative feedback to the Project Director concerning the progress of the project.

The system did not become fully operative. MDARs were received for Phase I, activities 1 - 11, but none was received for Phase II (July 1, 1977 - June 30, 1978). Project development and implementation matters took priority. An alternative system was instituted then, which consisted of the Evaluator reviewing project activities on-site on a quarterly basis. This provided some degree of feedback information, which was reported to the Project Director.

Objective Two - This section, viz. 5.E., is the fulfillment of the second process objective.

(2) Product Evaluation

(a) Statement of objective

By May, 1978, those 10th grade students who were identified at the start of School Year 1977-78 as deficient in the minimum mathematical competencies

necessary to complete the vocational education curriculum and who received the Learning Activity Packets (LAPs) during School Year 1977-78, will achieve mean scale scores significantly (0.05 level) higher than would be expected for untreated normative sample students. The pretest scale scores will be obtained in April/May 1977, from the Mathematics Test of the Comprehensive Tests of Basic Skills, Form S, Level 3 (CTBS-S-3). The posttest scale scores will be obtained from the same test, form, and level in April/May 1978.

(b) Techniques used

The norm-referenced evaluation model used in the project was based on having pre- and posttest scale scores from a standardized achievement test available for project students over a one year period. The Comprehensive Tests of Basic Skills (CTBS) is the standardized test used in the state of South Carolina. The pretest scores were to be those CTBS scores obtained during the seventh month of the ninth grade (9.7) from students in Dorchester County School Districts One (St. George), Two (Summerville), and Three (Harleyville - Ridgeville). The posttest scores were to be gained from the seventh month of the tenth grade from the same students.

It was assumed by the project proposal writers that each of the three districts tested all grade levels with the CTBS each year. However, it was discovered in September, 1977, that all three of the districts did not. Districts One and Three did, but not Two. Thus, pretest scores were available from St. George and Harleyville - Ridgeville, but not from Summerville, which is the largest of the three.

Conferences were held in October and November, 1977, to determine how to deal with this problem. The Evaluator submitted a plan to statistically reconstitute a project sample of pretest scores for Summerville and to perform a compound analysis at the end of the project year. More specifically, an approximation of the pretest scores was to be made by analysis

of CTBS scores for the three districts over the past three school years using test data from the South Carolina State Department of Education's testing program (grades 3, 6, and 11 in each school district in the state are tested with the CTBS in this program). After the posttest administration of the CTBS to project students was accomplished in April 1978, the following three analysis were to be accomplished (1) analysis of District One and Three test data, i. e., scale scores from project students whose parent schools were in these districts, would be performed using the specified statistical methods of the norm-referenced evaluation model, (2) analysis of all three districts would be made (including the reconstituted District Two pretest data) using the specified statistical methods aforementioned, and (3) a Chi Square statistic would be computed using the data from (1) and (2) above.

This plan was adopted and executed. Data from school years 1973-74, 1975-76, and 1976-77 from all three districts were examined. The differentials were determined, trends noted, and profiles for each district were established. A mean scale score for District Two (Summerville) was determined and scale scores were randomized about this mean for the project students. Arithmetic means and standard deviations for each district will be found in a subsequent section.

Posttesting was accomplished at the Dorchester Vocational Center during April, 1978, instead of at each parent school district. The project staff, after receiving instructions from the Evaluator, administered the CTBS to project students from all three districts. The tests were scored, converted to scale scores, and analyzed by the Evaluator.

During December, 1977, the decision was made to conduct a survey at the end of the project using both students and teachers who had been involved in the project. Such a survey would (1) provide qualitative data concerning

the curriculum materials and procedures used during the implementation of the project, and (2) provide feedback concerning refinements that could improve the LAPs and the procedures used to employ them. An open-ended interview technique was chosen to be employed in querying the student and teacher respondents/interviewees. Project staff members were to be the interviewers. The Evaluator, in conjunction with the project staff, developed two interview forms, one for students, and one for teachers. These forms are contained in the appendix to this section. Standardized procedures for conducting interviews and encoding the results were established. The Evaluator then developed a project student interviewee list by randomly (table of random numbers) choosing 55 project students from the 15 vocational curriculum areas involved (on a proportional basis). All teachers (N = 14) were to be respondent/interviewees.

(c) Students in the program

At the start of the school year (September, 1977) all 10th grade students entering the Dorchester Vocational Center from the three school districts of St. George, Summerville, and Harleyville - Ridgeville, were administered the Vocational Trade Math Comprehension Test, a diagnostic instrument that had been selected by the project staff prior to the start of the school year. The Evaluator developed a prescriptive rationale for the instrument that was keyed to the Learning Activity Package (LAPs) in a diagnostic - prescriptive manner.

A total of 333 students (the 10th grade population) received the instrument at the Vocational Center. Nine students did not complete the test and seven were absent each time that the test was scheduled. Forty students were found to require no remediational instruction (LAPs) and were not included in the project. A student was designated as a "project student" only if he required one or more LAPs. The remaining 277 students required some degree of remedial

instruction. Two hundred and ten of these completed the school year and the mathematics remediational program. Forty students officially dropped from the program. Twenty seven students dropped unofficially during the year.

Pretest-posttest scores (including the reconstituted pretest scores for District Two (Summerville) project students) for 201 students were available for analysis. The following are the distributions for each district.

District One (St. George)	District Two (Summerville)	District Three (Harleyville - Ridgeville)
N = 15	N = 140	N = 46

(d) Tables, charts, and graphs

Quantitative results:

Arithmetic means (scale scores), grade equivalents (based on the scaled scores), and standard deviations for the project students, by district, were as follows:

District	Pretest	Posttest
One: St. George	$\overline{X}$ = 443	$\overline{X}$ = 493
N = 15	GE = 5.9	GE = 7.7
	SD = 74	SD = 52
Two: Summerville	$\overline{X}$ = 491 (Reconst.)	$\overline{X}$ = 495
N = 140	GE = 7.6	GE = 7.8
	SD = 68	SD = 75
Three: Harleyville-Ridge.	$\overline{X}$ = 467	$\overline{X}$ = 478
N = 46	GE = 6.7	GE = 7.1
	SD = 70	SD = 73

Computational procedures listed in the South Carolina State Department of Education publication entitled "A Norm-Referenced Evaluation Model," were applied to the pretest (actual and reconstituted) and posttest mean scale scores. The results are shown below in terms of the districts used, the percentile rank conversions of the pretest mean scale scores, the expected posttest mean scale scores, the actual posttest means, the gains made (actual posttest) $\bar{X}$ minus the expected posttest $\bar{X}$, the national standard deviation of scale scores at the time of the posttest, and the outcomes in terms of statistical significance. Districts One and Three (combined) are presented first (actual pre- and posttest data). All districts, combined, are presented second (actual pre - and posttest data for Districts One and Three, reconstituted pretest data and actual posttest data for District Two).

Dist.	%-ile Conv.	Exp. Post X	Actual Post X	Gain	Nat. SD	Outcomes
1,3	19	496	482	(-)14	109.6	28 14 Significant at 0.05 level, but in incorrect direction
1,2,3	21	504	490	(-)14	109.6	16 14 Not significant at 0.05 level

Note: The computation of a Chi Square statistic was not performed, since statistical significance was not achieved in either analysis shown above.

Qualitative results:

During the latter part of May, 1978, the survey of project students and teachers was conducted. Results are as follows:

STUDENT SURVEY RESULTS

	Totals
I. What did you like least about the math program:	
A. Materials (learning packets, tests, resource)	
1. What would you change to make them better?	
1. No change necessary	37
2. Too many tests	8
3. Book hard to understand	6
4. More comprehensive diagnostic test	1
5. Make work harder; more of a challenge	3
2. If changes were made, would you recommend the program to others?	
1. Yes	54
2. No	1
B. Procedures (scheduling, time to complete, assistance)	
1. What would you change to make them better?	
1. No change necessary	33
2. Finish LAP requirements as soon as possible	8
3. Plan LAP work so to avoid class conflict	7
4. Confusion in vocational assignment	1
5. Too long to check books in lab. and assign new work	6
II. What did you like most about the math program?	
A. Materials (packets, tests, resources)	
1. How did the materials help here at the vocational school?	
1. The LAPs helped to show connection between vocational studies and Mathematics	42
2. No it didn't help	13
2. How did the material help at your home school?	
1. Didn't help because I've taken higher math	17
2. Made math at home school understandable	25

Totals

B. Procedures (scheduling, time to work, etc.)

1. What could you do after coming to math lab that you couldn't before?

1.	Review of specific math topic	11
2.	Plan and use math better	44

2. What would you have liked seen your improvements in that you did not see?

1.	Nothing	38
2.	Would like to see LAPs for higher math like, Algebra, metrics, geometry	15
3.	Would like better understanding of word problems	2

III. Usability

A. Did you notice an improvement in vocational classwork as a result of the math lab?

1.	No	18
2.	Yes	37

B. Did you see any difference in your home school classwork as a result of the math lab?

1.	No	21
2.	Yes	34

TEACHER SURVEY RESULTS

Totals

I. Procedure

A. What way were procedures satisfactory?

1.	Time to plan & schedule math, good	5
2.	Generally good	9

B. What improvements do you recommend?

1.	Voc. class should administer LAPs	1
2.	LAP work conflicted w/voc. studies/take home	1
3.	None	6
4.	Give slower students more time to do LAPs	4
5.	Measurement LAP too late in year	1
6.	Keep student math lab whole block	2

Totals

II. Materials

A. Did the materials meet the needs?

(a) If so, why?
(b) If not, why not?

1.	Well prepared as it applied to voc. area	6
2.	Questions should be more trade related	1
3.	Tangible student improvement	5
4.	Materials for class act nor available	2

B. What changes could you suggest to improve the program?

1.	More students should be in program	5
2.	Students informed of math requirements prior to enrolling	3
3.	Do not include special ed. std. in program unless trained teacher available	2
4.	Vocab. should be written for lower level	1
5.	Act. "B" interruptive to class activity	3

(e) Achievement of objective

Product (summative) objective one, as stated in the Project Evaluation Plan, was not achieved.

(f) Implications and conclusions

Even though statistical significance was not achieved, neither for Districts One and Three, nor all districts combined, it should be noted that an increase in the arithmetic means between the pre-and posttest administrations for all three districts was experienced. Moreover, it should be noted that the district with the lowest mathematical achievement before remediation via the LAPs, viz., District One, experienced the greatest increase at posttesting. District Three, which had the next lowest pretest scores, showed the next highest increase in posttest scores. District Two (reconstituted pretest scores), which had the highest level of mathematical achievement prior to remediation, showed the smallest increase in achievement after remediation (posttest), albeit an increase was experienced.

The increase in mathematical achievement, some of which can be attributed to the intervention or treatment in the form of the LAPs, can be seen also in the grade equivalence. The increase for District One students was 1.8 (pre: 5.9, post: 7.7). That for District Three was 0.4 (pre: 6.7, post: 7.1). For District Two, the increase was 0.2 (pre: 7.6, post: 7.8). It appears from these data that the LAPs are the most effective for the lower performing student, whereas, the higher the achievement level (but still in need of remediation, as established by the diagnostic test), the less spectacular the improvement.

Some commentary should be made concerning the developmental/implementation time, and the method of measurement/evaluation. Each of these will be discussed next.

The developmental time for establishing the program was very short. Essentially, it was developed over a period of only four months. It was implemented over the course of one scholastic year or nine months. The stringency of the time frame for both development and implementation left little time for refinement. Once a decision was made to go in a specific direction, circumstances precluded any change in direction, or at least, only minor changes. A longer development time would have produced refinements in curriculum materials and better standardization in measurement. Developmental programs of this type and scope usually have longer developmental time, typically one year. Implementation in such programs typically utilize one scholastic year for piloting the program and making the necessary refinements before a full implementation year is used.

The evaluation objective for a program of this type and scope, and especially for the age/achievement levels of the students involved, is somewhat presumptuous. Major changes in any domain of human behavior (cognitive, affective, or psycho-motor) for students in advanced adolescence are slow to be experienced, in any school system, in any state. To expect that statistically significant increases can be achieved under the circumstances is an

unrealistic expectation. For example, if a program of instruction can be developed in major part, implemented in a relatively effective manner, can produce some increase in achievement on standardized tests, and can be viewed favorably, attitude-wise, by both student and teacher, then educational significance has been attained.

This (educational significance) has been accomplished by the project staff, teachers, and students at the Dorchester Vocational Center. The norm-referenced (quantitative) data and the survey (qualitative) data substantiate this fact.

It is concluded that (1) the project has been a successful one, even though the increases experienced, as measured by the standardized test scores, were not statistically significant, (2) the project staff has been successful in developing and implementing a (remediational) program in mathematics instruction, as related to vocational school curriculums, and (3) the project staff, Dorchester Vocational Center teachers, and project students (10th graders from the three Dorchester County School districts) have produced an educational program, which at least, possesses educational significance.

5. F)

Problems encountered during this period were in two areas. It was determined the readability of the LAPs did not meet the 5th grade level, and so all materials were rewritten to fit this requirement, using the Fry Readability Scale as a measure. Consequently, it is strongly felt a program to improve reading levels and comprehension is needed. Such a program could greatly improve the students ability to recognize contemporary vocabulary in the real world of work as it applies to their vocational studies and math needs.

TEACHER SURVEY

Teacher

USABILITY

I. PROCEDURE

A. What way were procedures satisfactory?

_____

_____

B. What improvements do you recommend?

_____

_____

II. MATERIALS

A. Did the materials meet the needs?

_____

_____

(a) If so, why? _____

_____

(b) If not, why not? _____

_____

B. What changes could you suggest to improve the program?

_____

_____

_____

_____

STUDENT SURVEY

INTERVIEWER: _____ ____

NAME: _____

VOC. CLASS: _____

I. What did you like least about the math program:

A. Materials (learning packets, tests, resource)

1. What would you change to make them better?

_____

_____

2. If changes were made, would you recommend the program to others?

_____

_____

B. Procedures (scheduling, time to complete, assistance)

1. What would you change to make them better?

_____

_____

II. What did you like most about the math program?

A. Materials (packets, tests, resources)

1. How did the materials help here at the vocational school?

_____

_____

2. How did the material help at your home school?

_____

_____

B. Procedures (scheduling, time to work, etc.)

1. What could you do after coming to math lab that you couldn't before?

_____

_____

2. What would you have liked seen your improvement in that you did not see?

_____

_____

III. Usability

A. Did you notice an improvement in vocational classwork as a result of the math lab?

_____

_____

B. Did you see any difference in your home school class work as a result of the math lab?

_____

_____

Appendix C

MANAGEMENT DOCUMENT ACTIVITY REPORT

PROJECT TITLE: _____

PROJECT NUMBER: _____ REPORT NUMBER: _____

PHASE: _____

ACTIVITY: _____

_____

_____

_____

PERSON(S) RESPONSIBLE: _____

_____

DATE ACTIVITY WAS SCHEDULED: _____ DATE COMPLETED: _____

EXPECTED OUTCOMES: _____

_____

_____

_____

_____

PARTICIPANTS: _____

_____

_____

ACTUAL OUTCOMES: _____

_____

_____

_____

ADDITIONAL INFORMATION CONCERNING ACTIVITY: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

OTHER: _____

_____

_____

_____

_____

PREPARED BY: _____ TITLE: _____

DATE OF PREPARATION: _____

DORCHESTER VOCATIONAL CENTER
EXEMPLARY MATHEMATICS PROGRAM

SAMPLE

STUDENT COMPETENCY PROFILE

Name Doe, John

Voc. Course Auto Body B-6

TOPIC	LAP #	COMPONENT	DIAG. TEST: TEST ITEM	DIAG. TEST: % REQ'D	DIAG. TEST: ITEM REQ'D	ACCUM SCORE: ITEM	ACCUM SCORE: TOPIC	LAP SCHED
WHOLE NUMBERS	1	Add With/Without Carrying	~~1~~	100%	1	0		1
	2	Sub. With/Without Carrying	2,3	50%	2 or 3	100	70%	
	3	Multiplication	~~4~~,5	50%	4 or 5	50		
	4	Divide W/One Digit Without Rmdr.	6	100%	6	100		
	5	Divide W/Two Digit With Rmdr.	7	100%	7	100		
FRACTIONS	6	Concepts & Equivalent Fractions	38,~~39~~ ~~11,24,35~~	60%	3 of 5	20		6
	7	Add & Sub. W/Same Denominators	~~12~~, 51	50%	11 or 51	50		
	8	Add & Sub. W/Unlike Denominators	~~13,15~~	50%	13 or 15	0	24%	8
	9	Add & Sub. Mixed No. W/Out Borrow	~~14~~	100%	14	0		9
	10	Sub. Mixed No. With Borrow	~~16~~	100%	16	100		10
	11	Multiplication	17,18,19	66%	2 of 3	0		
	12	Division	~~20,21,22~~ ~~23~~	50%	2 of 4			12
DECIMALS	13	Addition	~~25~~	100%	25	0		13
	14	Subtraction	~~27,28,29~~	66%	2 of 3	0	25%	14
	15	Multiplication	30,31	50%	30 or 31	100		16
	16	Division	~~32,33~~	50%	32 or 33	0		
MEASUREMENT	17	Linear Measurement	~~40~~	100%	40	0	0%	17

*Overall Proficiency 30%

NOTE: Numbers in "TEST ITEM" are referenced to related diagnostic instrument test questions.

* Overall Proficiency = Sum of individual component proficiencies divided by number of components.

Appendix D

Appendix E

VOCATIONAL TRADE MATH COMPREHENSION TEST

DORCHESTER VOCATIONAL CENTER

DORCHESTER, SOUTH CAROLINA

STUDENT NAME _____

GRADE _____

SCHOOL _____

VOCATIONAL COURSE TO BE TAKEN _____

* X indicated problem N/A - see profile sheet

MINIMUM MATHEMATICS PROFICIENCY TEST

1. $532 + 425 + 674 = ?$

(A) 1621 (C) 1521

(B) 1531 (D) 1631

2. $7538 - 609 = ?$

(A) 8147 (C) 6929

(B) 7171 (D) 6939

3. $9000 - 4283 = ?$

(A) 5283 (C) 4717

(B) 5827 (D) 9717

4. $632 \times 100 = ?$

(A) 632 (C) 63,200

(B) 6,320 (D) 632,000

5. $426 \times 803 = ?$

(A) 342,078 (C) 337,178

(B) 340,278 (D) 331,278

6. $9\overline{)7214}$

(A) 80 R5 (C) 801 R5

(B) 805 (D) 811 R5

7. $19\overline{)5234}$

(A) 275 (C) 375

(B) 275 R9 (D) 276

8. "Eight Thousand fifty-two" written as a numeral is

(A) 80,052 (C) 800,520

(B) 852 (D) 8,052

9. In which of the drawings does the shaded area represent 4/5 of the total figure?

(A)

(B)

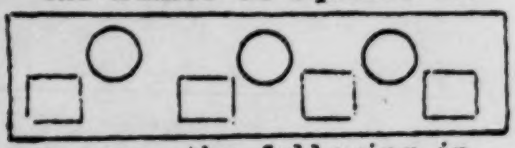
(C)

(D)

(A) (C)

(B) (D)

X 10. In the set below, the ratio of the number of circles to the number of squares is



(A) 3/7 (C) 4/7

(B) 3/4 (D) 4/3

11. Arrange the following in descending order (largest to smallest)
3, 5/7, 4 1/4, 1/3
Your answer would be:

(A) 5/7, 1/3, 3, 4 1/4

(B) 4 1/4, 3, 1/3, 5/7

(C) 4 1/4, 3, 5/7, 1/3

(D) 3, 4 1/4, 5/7, 1/3

12. $\frac{8}{15} + \frac{11}{15} = ?$

(A) $\frac{19}{30}$ (C) $\frac{19}{15}$ or $1\frac{4}{15}$

(B) $\frac{88}{15}$ or $5\frac{13}{15}$ (D) $\frac{88}{225}$

13. $\frac{3}{8}$

$+\frac{1}{4}$

(A) $\frac{4}{12}$ or $\frac{1}{3}$ (C) $\frac{4}{8}$ or $\frac{1}{2}$

(B) $\frac{5}{8}$ (D) $\frac{3}{32}$

14. 2 1/4 + 3 1/8 =

(A) 5 2/8 (C) 5 3/8

(B) 5 2/12 (D) 5 1/6

15. $\frac{13}{15}$

$-\frac{3}{10}$

(A) $\frac{10}{5}$ or 2 (C) $\frac{8}{30}$ or $\frac{4}{15}$

(B) $\frac{10}{15}$ or $\frac{2}{3}$ (D) $\frac{17}{30}$

16. 4 3/4 - 2 1/8 =

(A) 2 1/2 (C) 2 5/8

(B) 3 3/5 (D) 2 1/3

17. $\frac{3}{8} \times \frac{1}{7} = ?$

(A) $\frac{3}{56}$

(B) $\frac{3}{15}$

(C) $\frac{21}{8}$ or $2\frac{5}{8}$

(D) $\frac{4}{56}$ or $\frac{1}{14}$

18. $5 \times \frac{4}{7} = ?$

(A) $\frac{20}{7}$ or $2\frac{6}{7}$

(B) $\frac{35}{4}$ or $8\frac{3}{4}$

(C) $\frac{9}{7}$ or $1\frac{2}{7}$

(D) $\frac{20}{35}$ or $\frac{4}{7}$

19. $2\frac{1}{3} \times 6\frac{1}{2} = ?$

(A) $\frac{20}{5}$ or 4

(B) $\frac{91}{5}$ or $18\frac{1}{5}$

(C) $\frac{91}{6}$ or $15\frac{1}{6}$

(D) $12\frac{1}{6}$

20. $\frac{1}{8} \div \frac{3}{5} = ?$

(A) $\frac{5}{24}$

(B) $\frac{4}{13}$

(C) $\frac{4}{40}$ or $\frac{1}{10}$

(D) $\frac{3}{40}$

21. $7 \div \frac{5}{6} = ?$

(A) $\frac{5}{42}$

(B) $\frac{35}{6}$ or $5\frac{5}{6}$

(C) $\frac{42}{5}$ or $8\frac{2}{5}$

(D) $\frac{12}{6}$ or 2

22. $\frac{5}{9} \div 3 = ?$

(A) $\frac{5}{3}$ or $1\frac{2}{3}$

(B) $\frac{27}{5}$ or $5\frac{2}{3}$

(C) $\frac{15}{9}$ or $1\frac{2}{3}$

(D) $\frac{5}{27}$

23. $1\frac{1}{2} \div 2\frac{2}{3} = ?$

(A) $\frac{8}{2}$ or 4

(B) $\frac{9}{16}$

(C) $\frac{2}{8}$ or $\frac{1}{4}$

(D) $\frac{16}{9}$ or $1\frac{7}{9}$

24. "Forty-five and three hundredths" written as a numeral is

(A) 45.003 (C) 45.03
(B) 45300 (D) 45.3

25. 15.3 + 113.02 + 7411.008 = ?

(A) 7518.228 (C) 7539.328
(B) 7519.328 (D) 7528.318

X 26. .635 ____ .64

(A) > (greater than (C) =
(B) < less than (D) both A and B

27. 496.78 - 205 = ?

(A) 291.78 (C) 29.178
(B) 496.575 (D) 494.73

28. 9.99 - 0.9 = ?

(A) 0.99 (C) 9.01
(B) 9.09 (D) 9.90

29. 28.0
- .37

(A) 27.77 (C) 27.73
(B) 28.37 (D) 27.63

30. 63.7
x 2.1

(A) 1337.7 (C) 143.77
(B) 133.77 (D) 1437.7

31. 83.4 x 100 = ?

(A) .0834 (C) 8340
(B) 83.4 (D) 834

32. 7236 ÷ 100 = ?

(A) 723.6 (C) 723,600
(B) 7.236 (D) 72.36

33. 11.96 ÷ 5.2 = ?

(A) 23 (C) 2.3

(B) .23 (D) 230

X34. In the number 129.35469, 6 has the place value of

(A) tenths (C) ten-thousandths

(B) hundredths (D) millions

35. 3/8 = ?

(A) 2.66 (C) .33 1/3

(B) .375 (D) 375

X36. .638 = ?

(A) $\frac{638}{1000}$ (C) $\frac{63}{100}$

(B) $\frac{159}{250}$ (D) $\frac{310}{500}$

X37. .357 = ?

(A) 3.57% (C) .00357%

(B) 35.7% (D) 357%

38. What is 24% of 170?

(A) 408 (C) 40.8

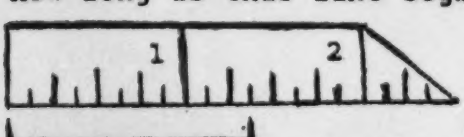
(B) 194 (D) 4080

39. What is 100% of 53?

(A) 106 (C) 5300

(B) 53 (D) 530

40. How long is this line segment?



(A) 1 1/2 (C) 1 3/16

(B) 1 1/4 (D) 1 3/8

X41. 2 yards 3 inches is the same as how many inches?

(A) 75 inches (C) 6 feet

(B) 64 inches (D) 5 feet

X42. One gram is the same measure as

(A) math book (C) paper clip

(B) pencil (D) nail clipper

X43. The dimensions of a room would be measured in

(A) liters (C) meters
(B) grams (D) kilometers

X44. Which of the following sets of metric prefixes are arranged from smallest to largest?

(A) centi, milli, kilo
(B) kilo, milli, centi
(C) kilo, centi, milli
(D) milli, centi, kilo

X45. 150 centimeters equals ___?___ meters

(A) 15.0 meters (C) 1.50 meters
(B) .150 meters (D) 1500 meters

X46. -3 + -3 = ?

(A) -6 (C) 9
(B) 6 (D) 0

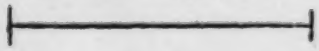
X47. 4 x -3 = ?

(A) 12 (C) 7
(B) -12 (D) 1

X48. 5, -3, -13, 0, 2 arranged from smallest to largest is

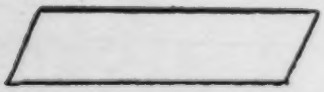
(A) 0,2,-3,5,-13 (C) -3,-13,0,2,5
(B) -13,-3,0,2,5 (D) 0,2,5,-3,-13

X49. What is the name of the geometric figure below?



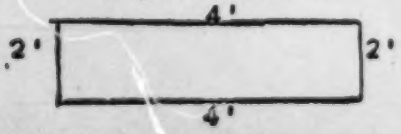
(A) ray (C) plane
(B) point (D) line segment

X50. What name best describes the geometric figure below?



(A) square (C) circle
(B) rectangle (D) parallelogram

51. Find the perimeter of the figure below.



(A) 12 ft. (C) 4 ft.
(B) 8 ft. (D) 16 ft.

LAP FUNCTIONS AND EXEMPTIONS FOR VOCATIONAL COURSES

LAP NUMBER	LAP FUNCTION	LAP EXEMPTIONS
1	Add With/Without Carrying	all vocational areas
2	Sub. With/Without Carrying	all vocational areas
3	Multiplication	all vocational areas
4	Divide W/One Digit Without Rmdr.	all vocational areas
5	Divide W/Two Digit With Rmdr.	all vocational areas
6	Concepts & Equivalent Fractions	N/A Masonry
7	Add & Sub. W/Same Denominators	N/A Masonry
8	Add & Sub. W/Unlike Denominators	N/A Masonry, & Off, Occup.
9	Add & Sub. Mixed No. W/Out Borrow	N/A Child Care, Masonry & Off. Occup.
10	Sub. Mixed No. With Borrow	N/A Auto Mech., Child Care, Masonry, Off. Occup. & Small Engines
11	Multiplication of Fractions	N/A Auto Mech., Electricity, HTG/AC, Masonry, Off. Occup. & Sm. Engines
12	Division of Fractions	N/A Auto Mech., Electricity, Forestry, HTG/AC, Masonry, Off. Occup. & Sm. Engines
13	Addition of Decimals	all vocational areas
14	Subtraction of Decimals	all vocational areas
15	Multiplication of Decimals	all vocational areas
16	Division of Decimals	all vocational areas
17	Linear Measurement	all vocational areas

Appendix F